L Number	Hits	Search Text	DB	Time stamp
1	176	scene$3 with (subdivid$6 divid$6) with frame$5	USPAT	2003/11/21 14:55
2	89	scene$3 near8 (subdivid$6 divid$6) near8 frame$5	USPAT	2003/11/21 15:09
3	3626	frame near9 start$6 near9 end$5	USPAT	2003/11/21 15:12
7	630	(frame$3 near4 point$3) with ((start$5 begin$8) and end$3)	USPAT	2003/11/21 16:04
8	30	(frame$3 near4 indicat$6 near5 point$3) with ((start$5 begin$8) and end$3)	USPAT	2003/11/21 16:05
9	1	6353461.pn. and (audio voice$3)	USPAT	2003/11/21 16:26
10	1	6353461.pn. and (comment$5)	USPAT	2003/11/21 19:06
11	1	6353461.pn. and (network$3)	USPAT	2003/11/21 16:41
12	1	6353461.pn. and (database$5)	USPAT	2003/11/21 16:53
13	1	6353461.pn. and (file$3 generat$6)	USPAT	2003/11/21 17:53
14	158	(file$3 adj generator)	USPAT	2003/11/21 18:14
15	11	(file$3 adj generator) with database$5	USPAT	2003/11/21 17:34
16	0	6353461.pn. and (filter$5)	USPAT	2003/11/21 16:56
17	11	(file$3 near generator$3) with database$5	USPAT .	2003/11/21 17:38
18	222	(file$3 near generat$5) with database$5	USPAT	2003/11/21 17:38
19	1	6353461.pn. and (file$3)	USPAT	2003/11/21 17:53
20	1	6353461.pn. and (folder$5 database$5)	USPAT	2003/11/21 18:43
21	1	6353461.pn. and (folder$5 director$5 database$5)	USPAT	2003/11/21 17:56
22	1	6353461.pn. and (folder$5 directory directories database$5)	USPAT	2003/11/21 18:13
23	38	(file$3 adj generator) with (retriev$6 stor$6)	USPAT	2003/11/21 17:57
24	4	(file$3 adj generator) with (directories directory)	USPAT	2003/11/21 18:02
25	9	(file$3 adj generator$3) with (media multimedia audio video)	USPAT	2003/11/21 18:02
26	1	6353461.pn. and ('585')	USPAT	2003/11/21 18:13
27	15	(file$3 adj generator$5) with (delet$5 add$3)	USPAT	2003/11/21 18:14
30	6	(file adj generator$5) with edit$3	USPAT	2003/11/21 18:31
31	7	((media multimedia file) adj generator$5) with edit$3	USPAT	2003/11/21 18:32
32	50	((media multimedia file) adj generator$5) with (generate generating edit$3)	USPAT	2003/11/21 18:40
33	296	generated near media	USPAT	2003/11/21 18:40
34	0	(generated near media) with reduce with (buffer$3 memor$5)	USPAT	2003/11/21 18:41
35	4	(generated near media) with (buffer$3 memor$5)	USPAT .	2003/11/21 18:41
36	1	6353461.pn. and (rate$5)	USPAT	2003/11/21 18:58
37	4	6353461.uref.	USPAT	2003/11/21 19:03
38	0	6353461.uref. and comment$3	USPAT	2003/11/21 19:04
39	6	"6353461"	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/11/21 19:03
40	8	(("6154600") or ("6094522") or ("6092119") or ("6091778") or ("6085019") or ("6067126") or ("6064793") or ("6044198")).PN.	USPAT	2003/11/21 19:04
41	0	((("6154600") or ("6094522") or ("6092119") or ("6091778") or ("6085019") or ("6067126") or ("6064793") or ("6044198")).PN.) and comment$3	USPAT	2003/11/21 19:04
42	1	6353461.pn. and ((user$3 editor$5 director$3) with comment$5)	USPAT	2003/11/21 19:07
43	1	6353461.pn. and (operator$5 director$5 editor$5)	USPAT	2003/11/21 19:22
44	1	6353461.pn. and (name$3 list$3)	USPAT	2003/11/21 19:12
45	17	(script$5 editor$5) with list$3 with comment$3	USPAT	2003/11/21 19:17
46	35	(edit$5) with list$3 with comment$3	USPAT	2003/11/21 19:17
47	1	6353461.pn. and (software$5 program$5 instruction$3)	USPAT	2003/11/21 19:29

48	1	6353461.pn. and (disk$3 memor$3 buffer$5 cd)	USPAT	2003/11/21 19:34
49	1	6353461.pn. and (review$5)	USPAT	2003/11/21 19:35
50	1	6353461.pn. and (review$5 with database$5)	USPAT	2003/11/21 19:36
51	0	6353461.pn. and (review$5 with (dynamic$5 automatic$6))	USPAT	2003/11/21 19:41
52	1	6353461.pn. and (dynamic$5 automatic$6)	USPAT	2003/11/21 19:37
53	1	6353461.pn. and (review$5 with (instruct$5))	USPAT	2003/11/21 19:41
54	1	6353461.pn. and (review$5)	USPAT	2003/11/21 19:42
55	1	6353461.pn. and (review$5 with system$3)	USPAT	2003/11/21 19:43
56	1	6353461.pn. and (review$5 with playback$5)	USPAT	2003/11/21 19:47
57	1	6353461.pn. and (comment$5 with edit$6)	USPAT	2003/11/21 19:47
–	10	editor$5 with review$6 with comment$3	USPAT	2003/11/20 14:42
–	0	6262724.pn. and (review$5 approv$6 comment$5)	USPAT	2003/11/19 13:28
–	1	6262724.pn. and (edit$6)	USPAT	2003/11/19 13:28
–	1	(editor$5 with review$6 with comment$3) and (player$5)	USPAT	2003/11/19 14:54
–	250	editor$5 with comment$3 with edit$9	USPAT	2003/11/19 14:54
–	2	editor$5 with comment$3 with edit$9 with (approv$5 reject$5)	USPAT	2003/11/19 15:40
–	0	ladp with director$3 with gateway$3	USPAT	2003/11/19 15:41
–	22	ldap with director$3 with gateway$3	USPAT	2003/11/19 15:50
–	1	6353461.pn. and (player$3)	USPAT	2003/11/19 15:54
–	1	6353461.pn. and (window$3)	USPAT	2003/11/19 15:58
–	1	6353461.pn. and (approv$5 reject$5 review$6)	USPAT	2003/11/20 14:42
–	1	6353461.pn. and (editor$5 reviewer$5)	USPAT	2003/11/19 16:00
–	1	6353461.pn. and ((edit$5 review$5) with comment$5)	USPAT	2003/11/21 16:22
–	10	(("5978648") or ("5999173") or ("6426778") or ("6489969") or ("5995951") or ("6201924") or ("6212527") or ("5852435") or ("6484199") or ("6411725")).PN.	USPAT	2003/11/21 19:15
–	2	((("5978648") or ("5999173") or ("6426778") or ("6489969") or ("5995951") or ("6201924") or ("6212527") or ("5852435") or ("6484199") or ("6411725")).PN.) and ((edit$5 review$5) with comment$5)	USPAT	2003/11/19 16:07
–	6	(("5467288") or ("5724605") or ("5752029") or ("5754851") or ("5946445") or ("6058236")).PN.	USPAT	2003/11/19 16:14
–	2	("9423428").PN.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/11/19 16:14
–	23	((real adj player$3) (media adj player$3) (quicktime$3)) with (video near9 recorder$5)	USPAT	2003/11/20 11:42
–	1	6353461.pn. and (start$3 end$6)	USPAT	2003/11/20 17:07
–	1	6353461.pn. and (time$3 with comment$5)	USPAT	2003/11/20 16:43
–	1	6353461.pn. and (start$3 begin$9 end$6)	USPAT	2003/11/20 18:10
–	1	6353461.pn. and (frame$4)	USPAT	2003/11/21 14:54

Figure 12: The `ceedit` display

Figure 12 shows the main interface to `ceedit`. The tool displays the computed shot boundaries in three sections. The video is displayed in the upper left section with VCR controls that allow the video to be played at normal speed or advanced **frame-by-frame**. A horizontal timeline is displayed to the right of the video with shots marked by gray boundary lines and the current position marked as a vertical black line. The timeline allows a user to select and examine individual shots. A keyframe display is shown at the bottom of the interface that displays several keyframes from the neighborhood of the selected shot boundary. These three sections present an overview of the video in a form designed to allow the user to judge whether or not the computed boundary is accurate.

There are several ways for a user to navigate through the computer-generated index of shots. A user can control the current position of the video stream, scanning through the video in order to quickly determine whether the computed shots are reasonably accurate. The control bar located below the video display provides the basic controls for manua navigating through the video. Alternatively, a user can select individual shots and observe the keyframes around the neighborhood of a shot boundary. The shot **start** and **end** positions are displayed for the current selection in the timeline display. These positions can be edited through the type-in fields or adjusted in **frame** increments via the arrows. The **start** and **end** positions can also be adjusted directly from the timeline by dragging the boundary marker The video control bar allows the user to position the video display at the **start** or **end** of the selected shot and move forward and backward **frame-by-frame**, to verify the accuracy of a computed shot boundary.

A selected region of the video stream can be played to determine if it contains a shot boundary. After determining whether a boundary is accurate or not, it can be adjusted or deleted altogether. Similarly, new boundaries can be inserted if the algorithm misses a shot boundary. Two basic commands are provided to add or delete boundaries. The **Insert Shot Boundary** menu command adds a new shot boundary at the current position within the video stream. Th operation breaks the shot containing the current position into two separate shots. The **Delete Shot Boundary** menu command removes one of the boundaries of the currently selected shot. By default, the user is prompted to select wh boundary to delete. The delete operation effectively merges the two shots on either side of the deleted boundary.

All of the actions above allow a user to correct mistakes in the computed shot boundaries. An algorithm may detect a transition which does not correspond to an actual shot boundary or it may fail to detect a shot boundary. In addition, computed shot boundary may be correct, but offset by several frames from the actual transition. In all of these cases, these inaccuracies should be corrected before the shot index information is added to the database.

When a user is ready to insert the shot index into the database, `ceedit` queries the user for the document, segment an **scene** which will become the parents for the shot index. If the segment and **scene** indices are missing for the selected document, they can be automatically created. If the selected **scene** is already associated with a set of shots, the interf prompts the user as to whether the existing shots should be replace, or merged with the newly generated index. The merge operation compares the existing shot index with the index generated by `ceedit`. Two separate shot boundarie within a tolerance of a few frames of each other are merged into a single shot entry with the boundary marked at the midpoint.

The content extraction tool interfaces introduce into the VOD system a suite of shot detection algorithms which can used to help a user annotate the shot boundaries of a document. Using the automated shot detection process, the complex task of identifying and marking shot boundaries is reduced to a simpler process of verification.

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Dave Bacher
Mon Mar 10 18:26:36 PST 1997

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Ceedit

The content extraction shot boundary editor, named `ceedit`, provides an interface to examine the output of the shot detection algorithms and convert it to a format that can be stored in the database. The shot detection algorithms prod a file describing the **frame** numbers at which shot boundaries were detected. `ceedit` reads this file and displays a timeline, with shot boundaries marked as shown in figure 12. A user can then correct the shot boundaries before the information is added to the database.